

# Anatomy day 3

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What holds us together

Cells & Tissue

# TYPES OF TISSUE IN THE BODY

# Sutra 2.46

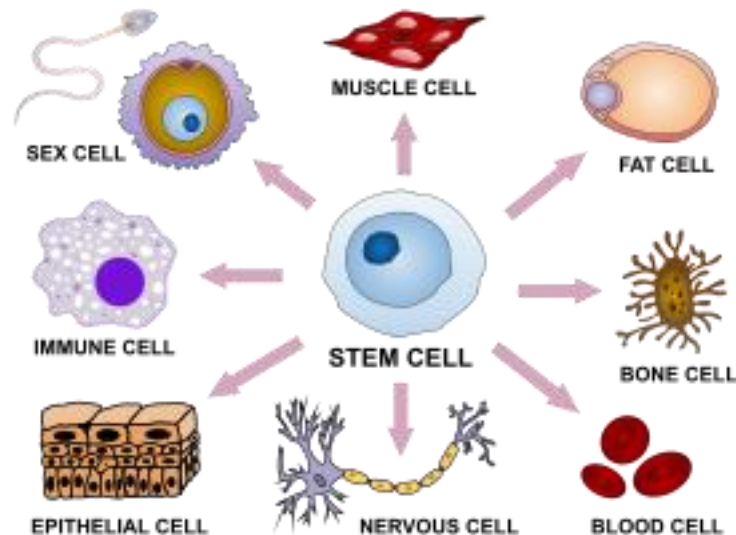
## Sthirasukhamasanam

- This sutra describes asana but can be so much more, it can be a lens through which we can view all living things.
- The body has space and stability, structure and suppleness, a cell has a membrane but in order to survive it needs to allow waste and nutrients to pass through
- Asana can be both expansive and centered, active and relaxed, there is synergy in contraction and elongation
- What is homeostasis?

As yogis we know that we do not need to understand all the details to appreciate the miracle of existence but we remain curious

# Cells

- The shape of our cells determines the way they function and the way they are aligned
- When tension is put on our cells because of a tight muscle or poorly aligned joint they don't function optimally
- Hatha yoga plays with movement and relaxation to enhance health at the depth of cellular level



# Types of tissue

- **Connective tissue:** The most abundant of tissue types that performs a variety of functions including support and protection (fat, fascia, cartilage, bone, blood and lymph)
- **Nerve tissue:** Composed of specialized cells which receive stimuli and conduct impulses to and from all parts of the body
- **Muscle tissue:** Tissue which composes muscle (skeletal, smooth and cardiac)
- **Epithelial tissue:** Covers the body's surface and forms the lining for most internal cavities and organs



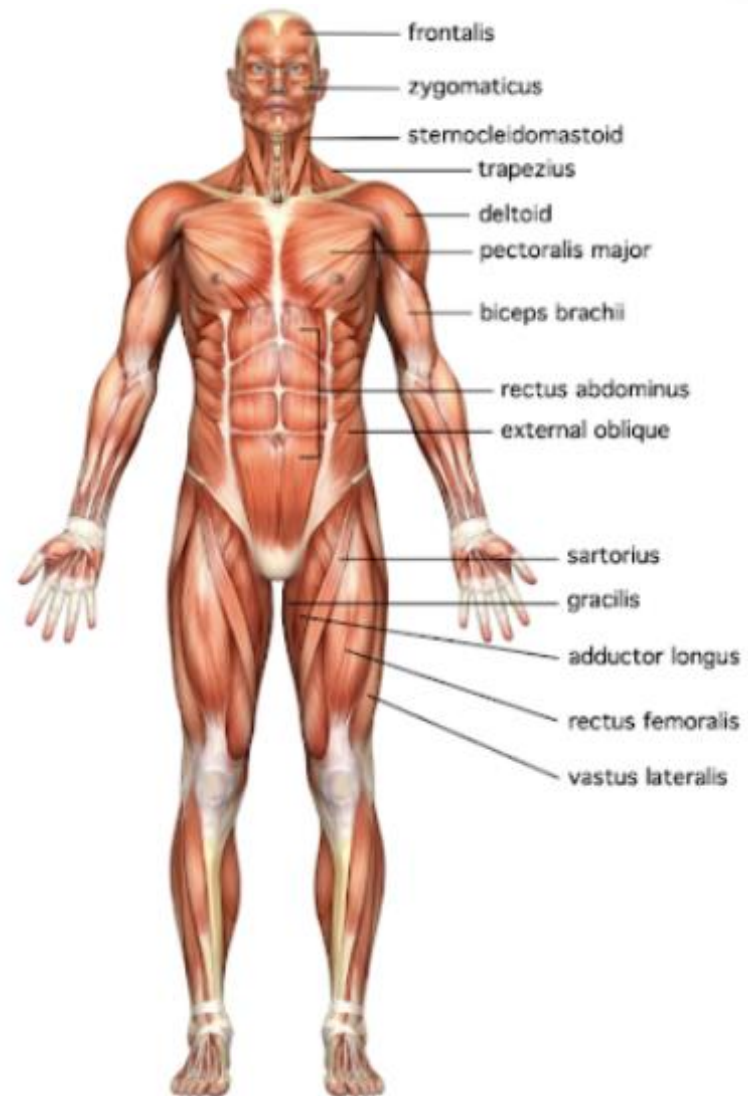
Today we focus on the

# MAJOR MUSCLES OF THE BODY

... as applicable to yoga

# The muscles

- Your body has over 600 muscles
- Muscle contracts to move bones and body parts
- Muscle makes up approximately half of your body weight
- Muscles are elastic in nature, they stretch but don't maintain their length once released
- Brachii (e.g. biceps brachii): the muscle has two attachment points but one belly/insertion



# What are they? (p. 36)

- Three different types of muscle
- Attached to the skeleton
- Provides movement and stability
- Skeletal muscle is attached to the bones by tendons. The origin is the proximal attachment to the bone and closer to the midline, the insertion is the distal attachment to the bone and further from the midline
- Move either one (monoarticular), two (biarticular) or multiple (multiarticular) joints



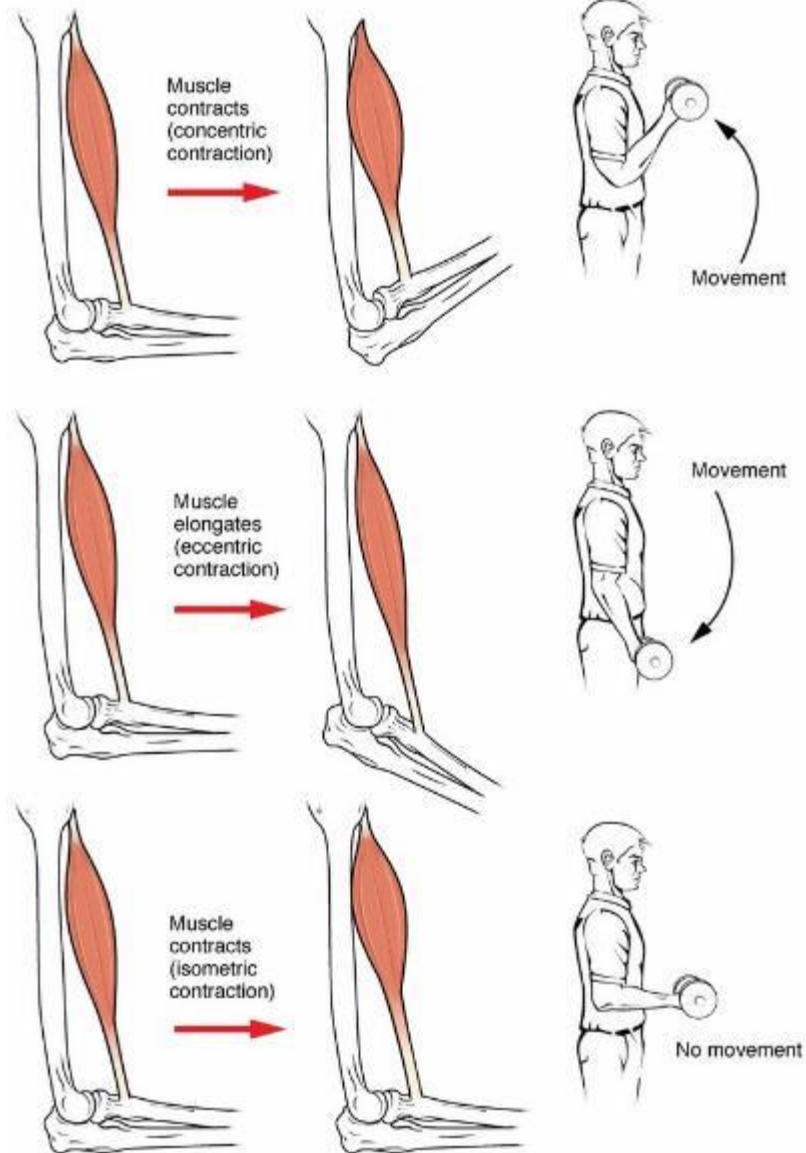
# Types of contractions (p.41)

## Isotonic contractions:

- Concentric contraction
  - Muscle shortens while maintaining constant tension through a range of motion
- Eccentric contraction
  - Muscle contracts while lengthening

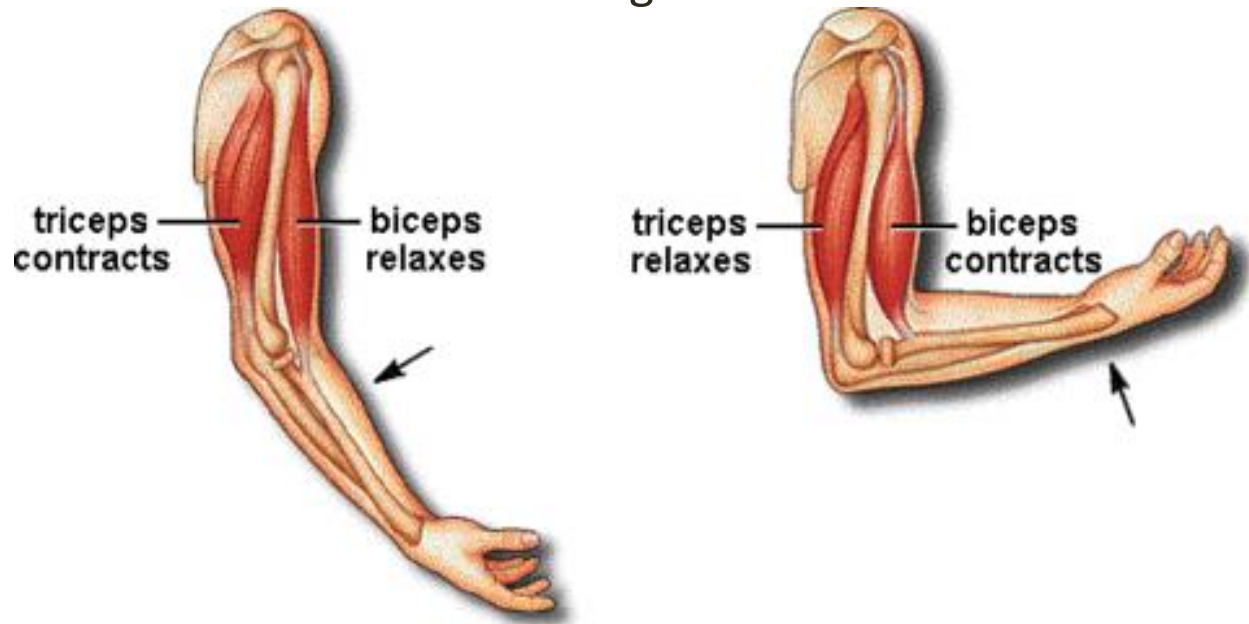
## Isometric contraction

- The muscle generates tension but doesn't shorten and the bones don't move



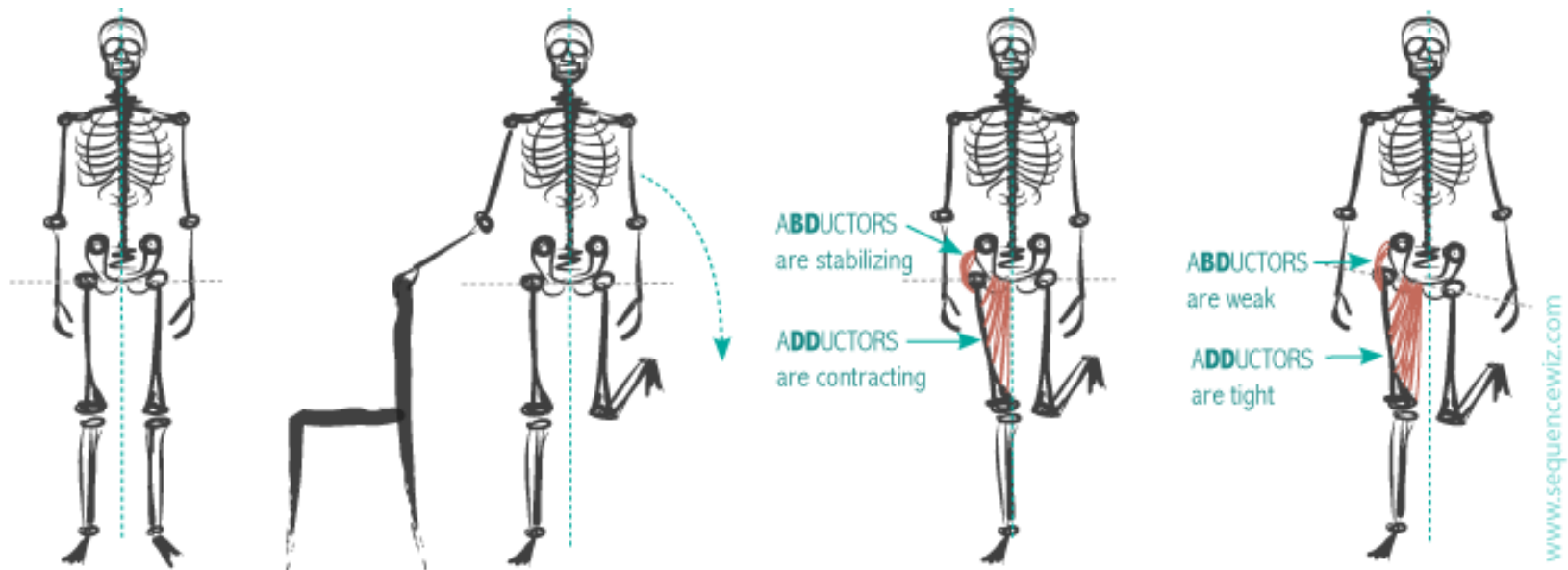
# Reciprocal inhibition

- Prime mover: Agonist
  - Determines movement by contracting
- Opposer: Antagonist
  - Works with the agonist but creates action by relaxing
- Assister: Synergist
  - Assists and fine-tunes the action of the agonist



# Another example: Adductors and abductors

- When the leg abduct the adductors relax
- When the leg adducts the abductors relax



**STANDING ON BOTH FEET  
(HIPS, KNEES AND ANKLES STACKED)**  
Most stable position

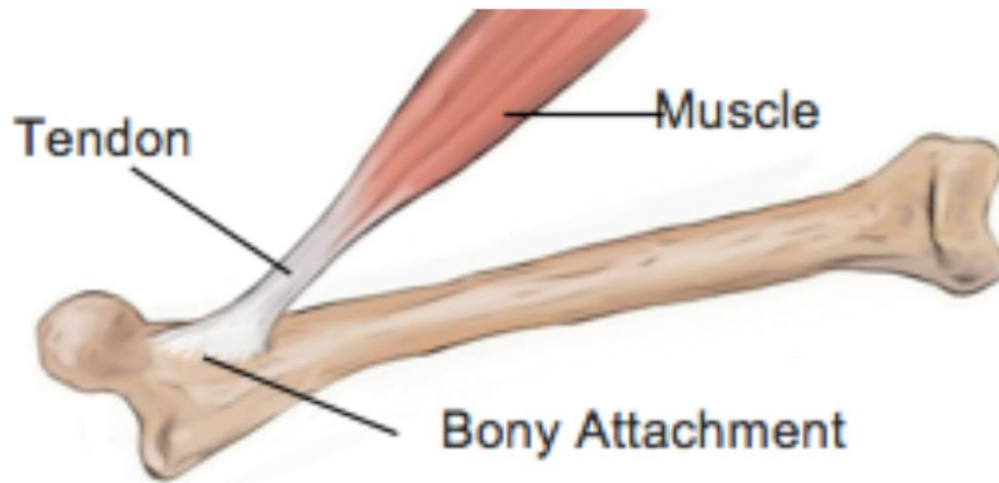
**LEFT FOOT IS RAISED  
(JOINTS ON THE RIGHT SIDE STACKED)**  
Will fall down to the left unless  
holding on to something

**LEFT FOOT IS RAISED  
(RIGHT ANKLE IS AT THE MIDLINE)**  
Right foot displacement is necessary to  
maintain balance; aDDuctors are  
contracting, aBDuctors are stabilizing.

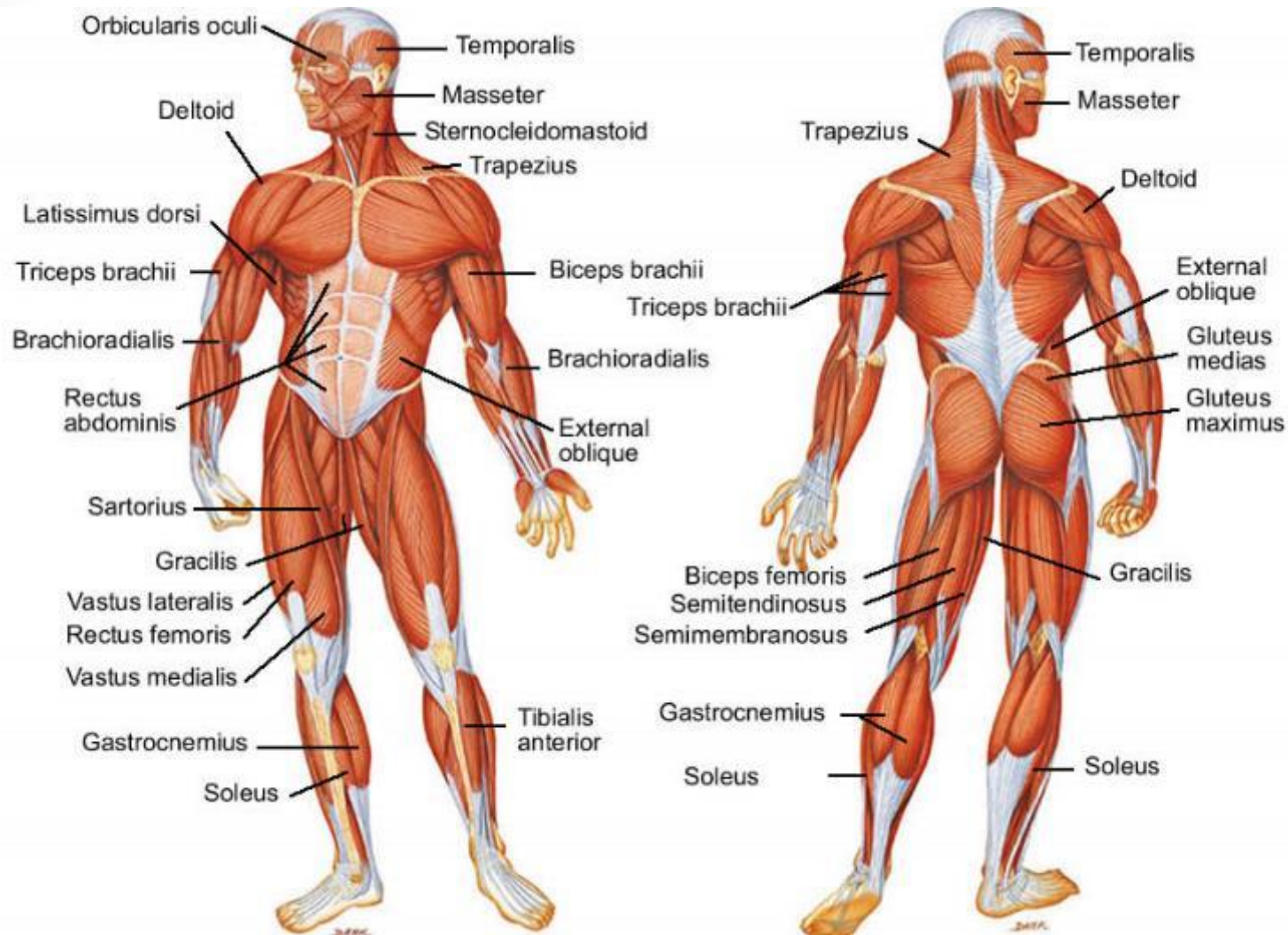
**LEFT SIDE OF THE PELVIS  
DROPS DOWN MORE THEN 5 DEGREES**  
Weak aBDuctors on the right side  
cannot hold the pelvis leveled

# How are muscles attached to bone? (p. 37)

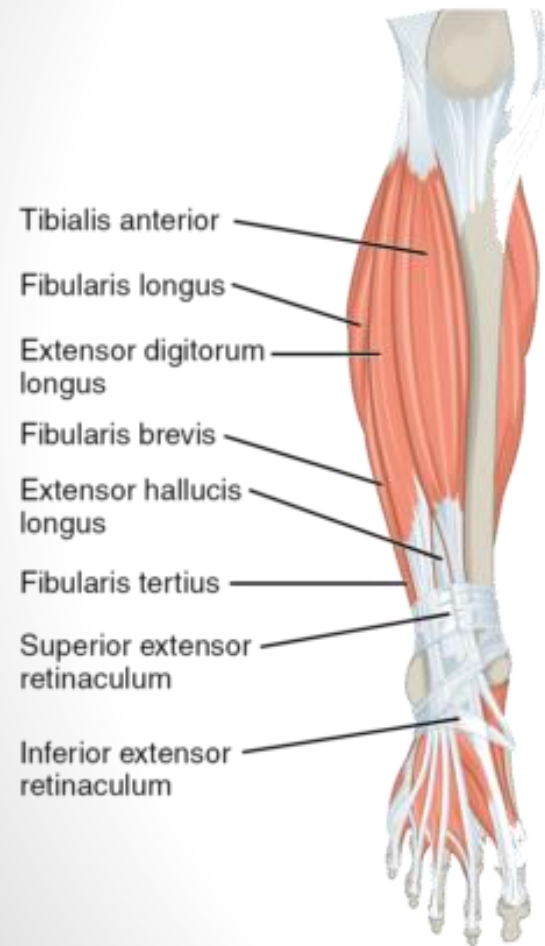
- Muscles are attached to the bone through tendons which transmit the forces from the muscles to move the joints.
- Tendons send signals to the brain about muscle tension and joint position to the brain.
- Muscles and tendons work together to exert **pulling** force



# Let's take a closer look



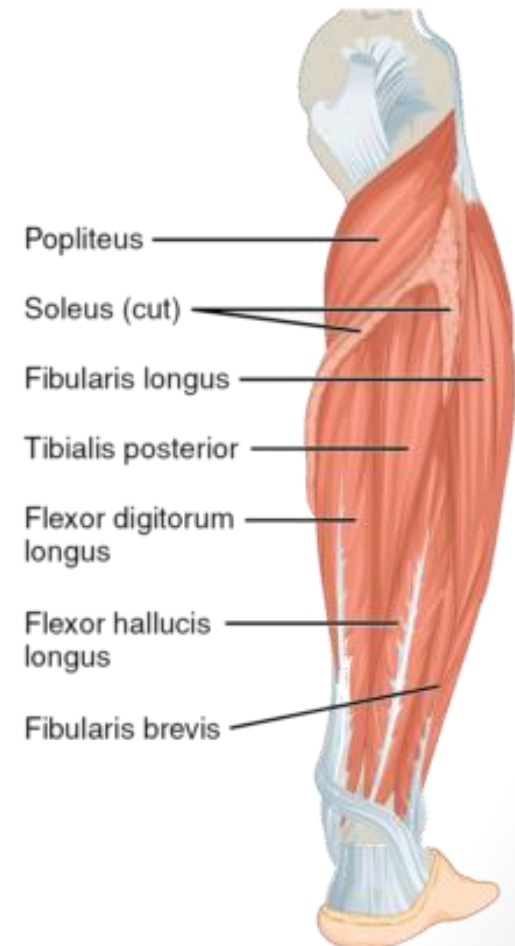
# Lower leg (leg) muscles (p.202)



Superficial muscles of the right lower leg (anterior view)

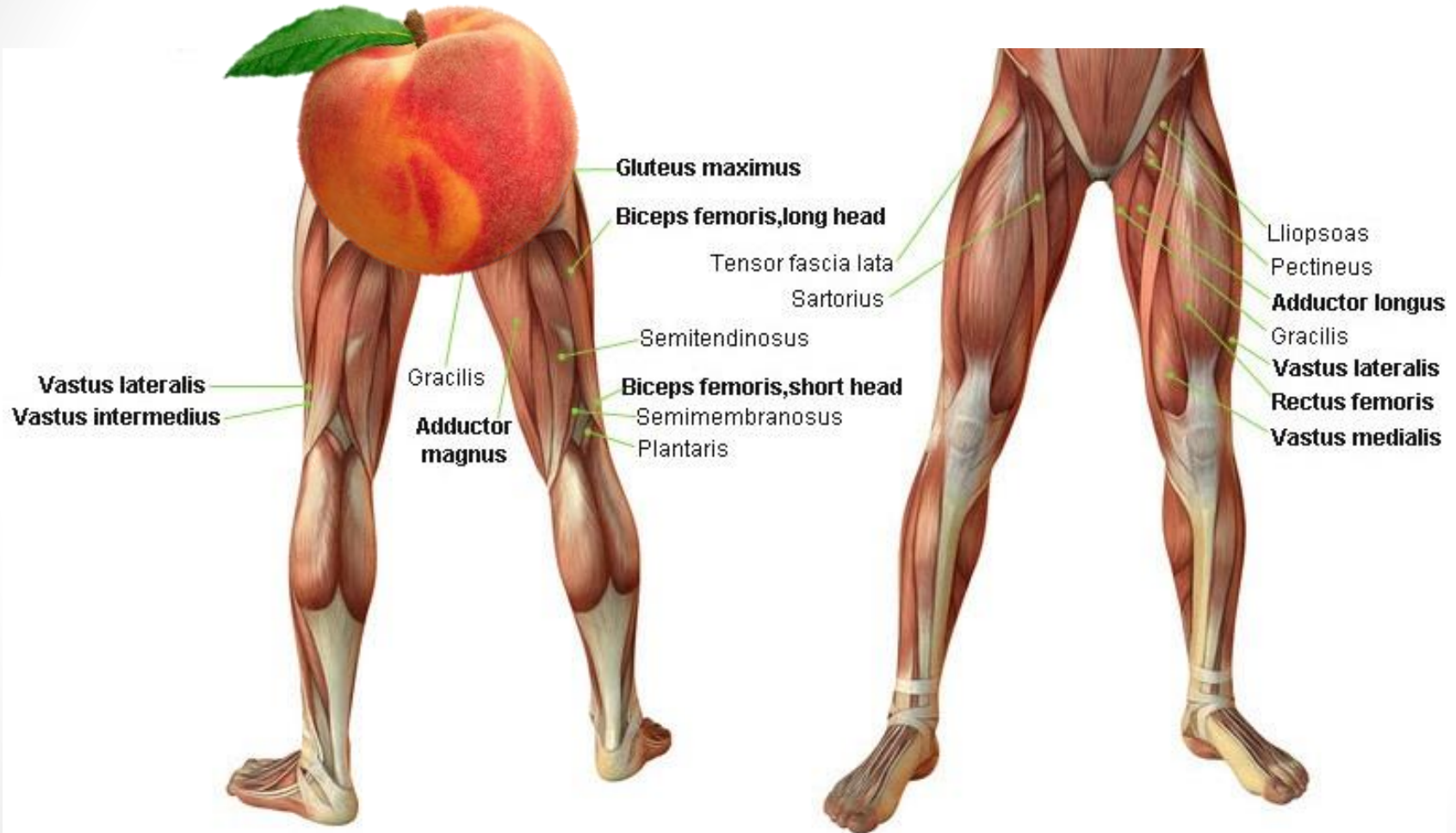


Superficial muscles of the right lower leg (posterior view)



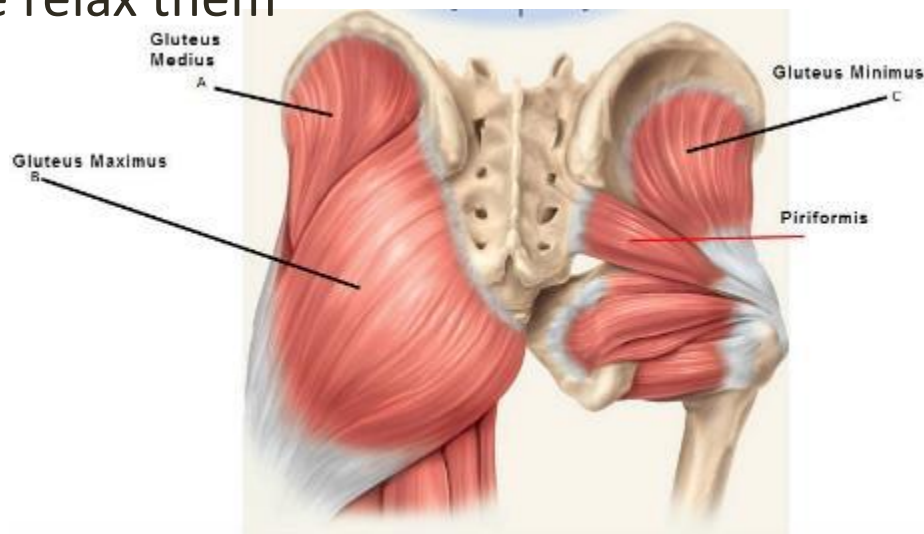
Deep muscles of the right lower leg (posterior view)

# Upper leg muscles (p.64)



# Cutie with a Glute(y) (p.64-73)

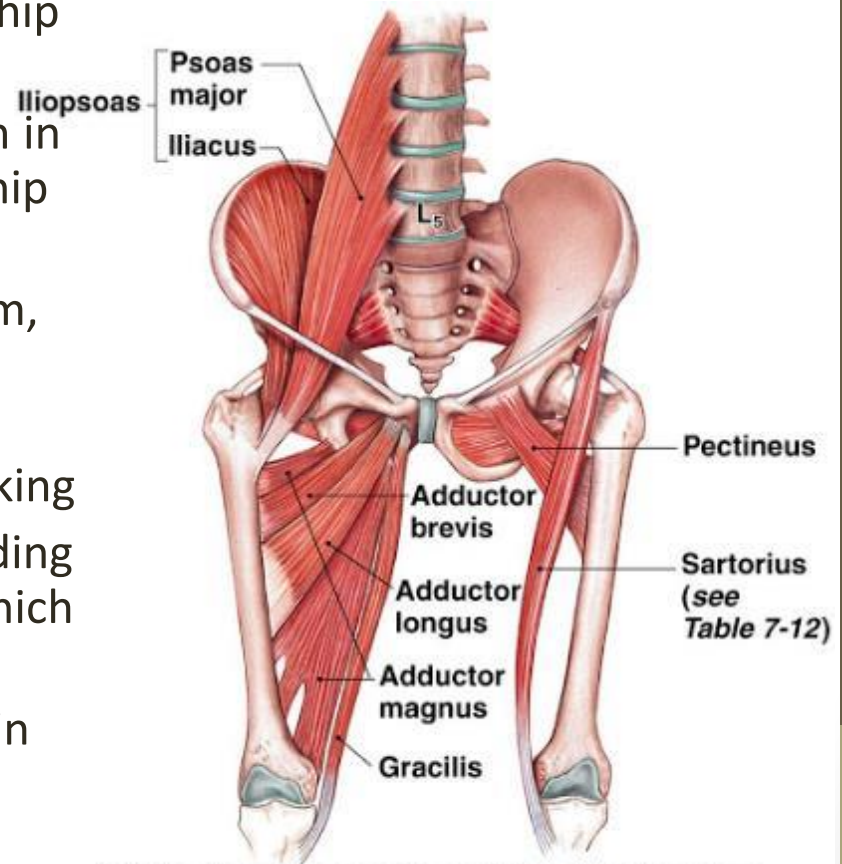
- The gluteal muscles are a group of muscles that make up the buttocks, they originate from the ilium and sacrum and insert on the femur
- Strong supportive glutes are key to a safe, pain free practice. They stabilize the femur, rotate it internally and draw the leg back.
- We need to keep the glutes strong so they are still able to support our body when we relax them





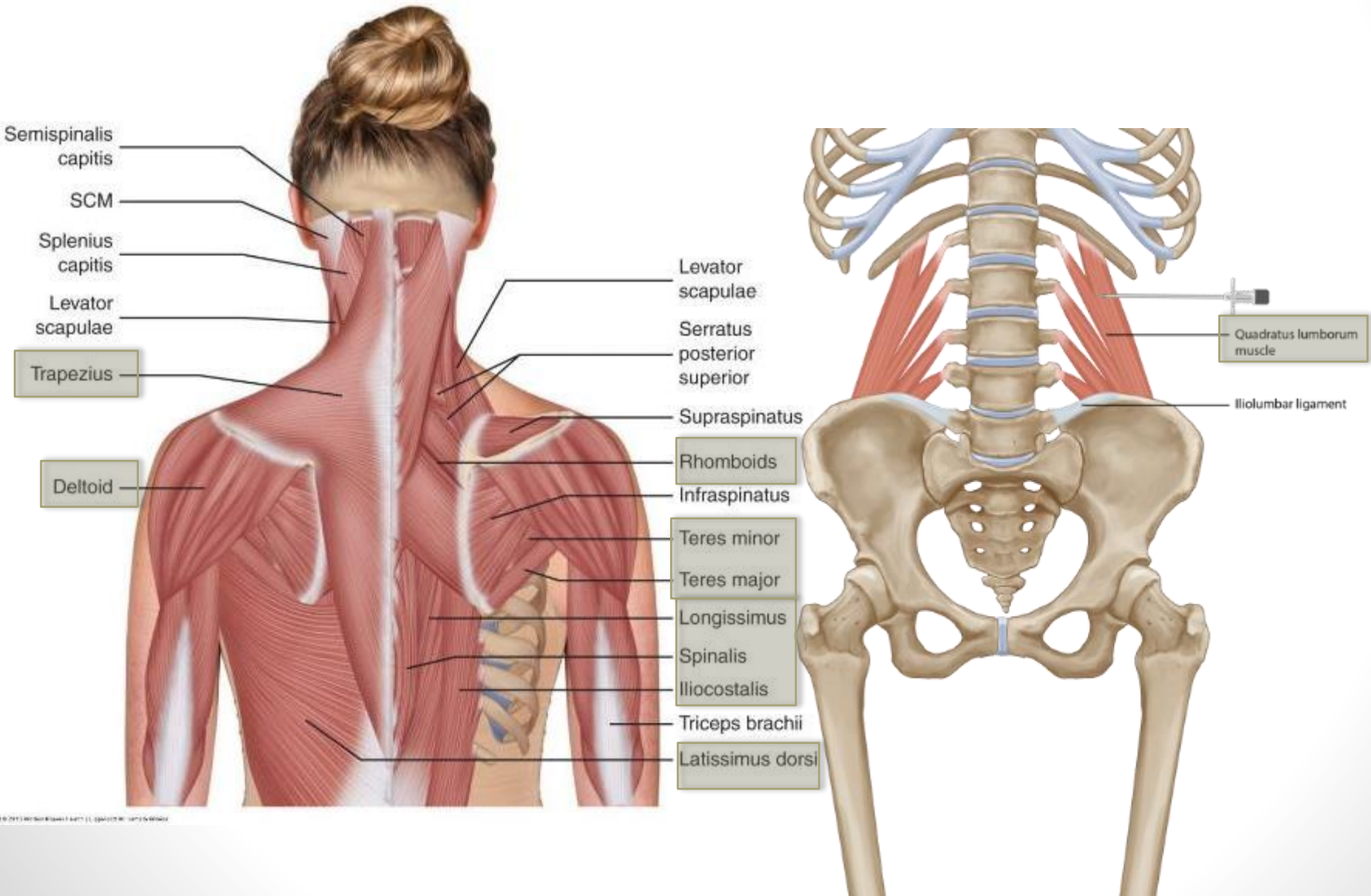
# Iliopsoas (p.57)

- Psoas major + Iliacus on each side
- The fight or flight muscle and major hip flexor
- Tightness can lead to hyperextension in the lower lumbar spine and limited hip extension
- Connection to central nervous system, interweaves with vagus nerve
- Keeps the femur from abducting too much during the swing phase of walking
- Strengthened and stretched by standing poses and certain seated poses in which the thighs abduct
- Tight psoas? Tightness and dullness in lower back



(c) The iliopsoas muscle and the adductor group

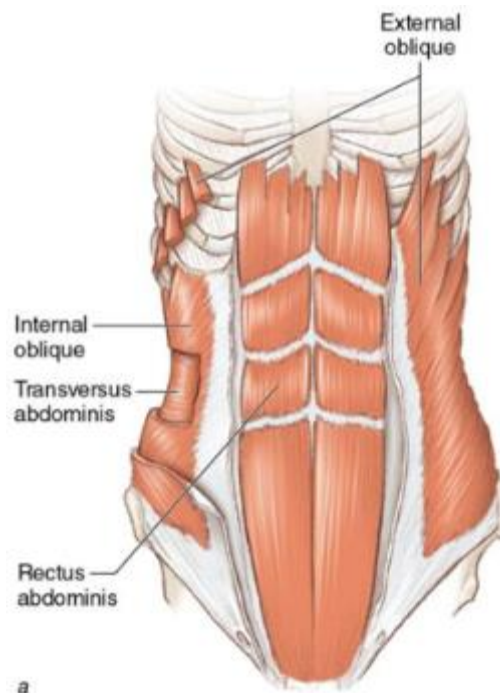
# Main back muscles (p. 128)



# Core muscles (p. 118)

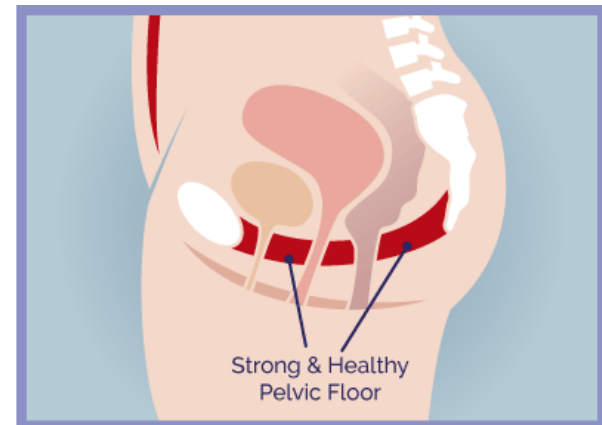
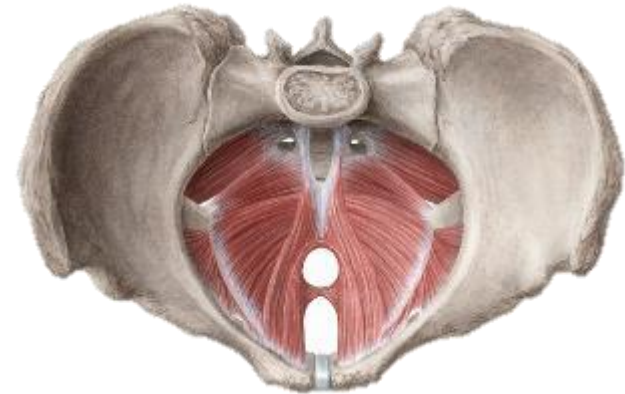
- Connecting us to our sense of power
- Helps us gain stability and ease in asana
- Deep and superficial core: the deeper local system switches on just before you start moving, stabilizing the spine. The superficial system deals with extra loads from moving bones and limbs

- Rectus abdominus
- External obliques
- Internal obliques
- Transverse abdominus

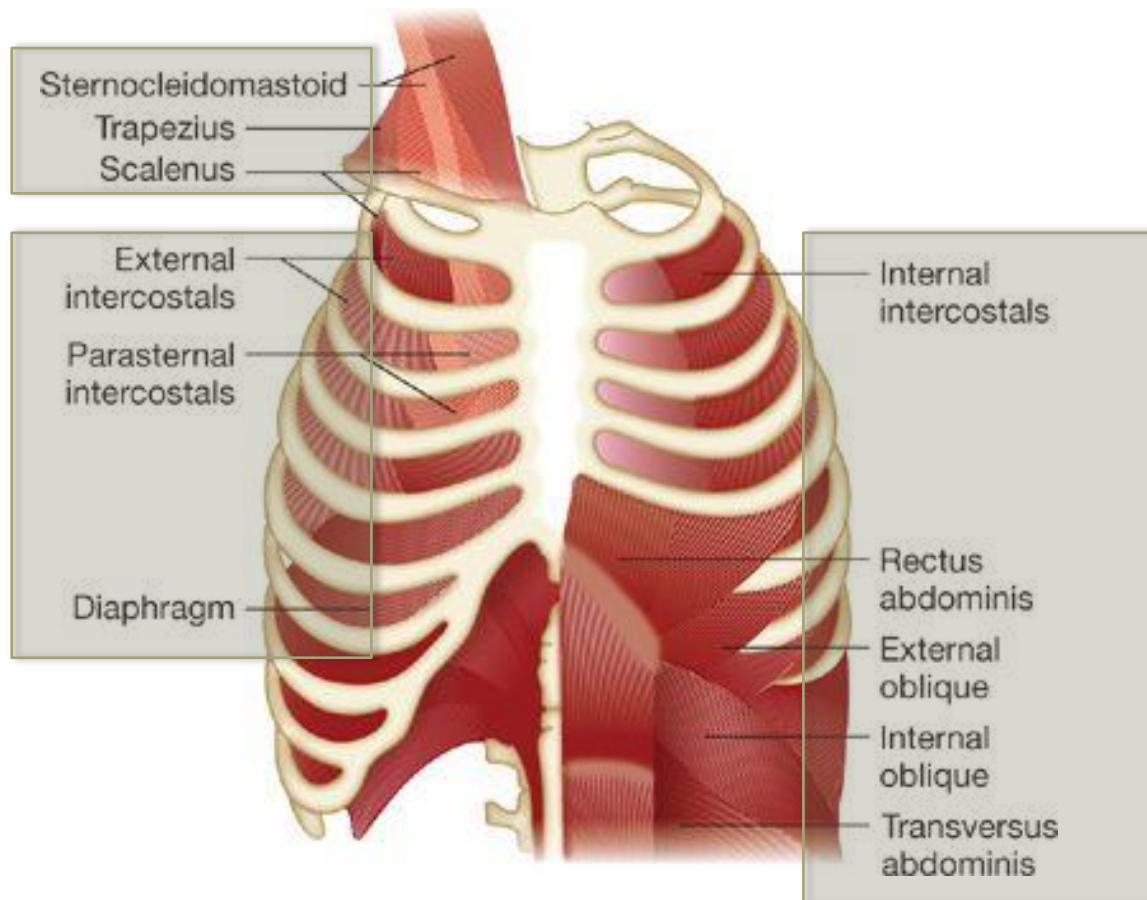


# Pelvic floor

- Superficial layer
  - Two bands of muscles that cross
  - Move coccyx towards pubis
  - Moves ischial tuberosity in
- Deep layer
  - Sort of like a hammock in which the pelvic organs rest
  - Lifts upwards (Mulbanda or root lock)

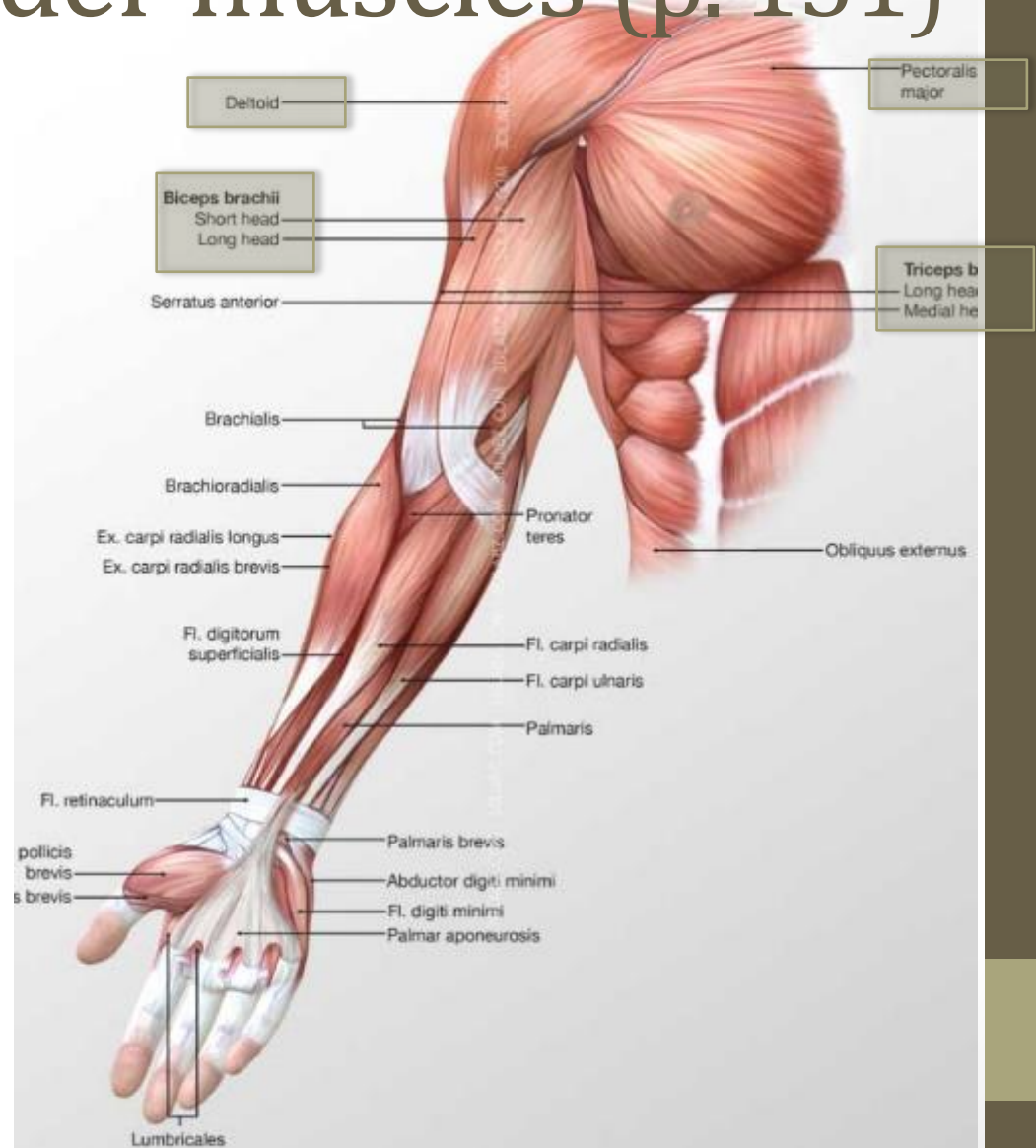


# Main respiratory muscles (p.212)



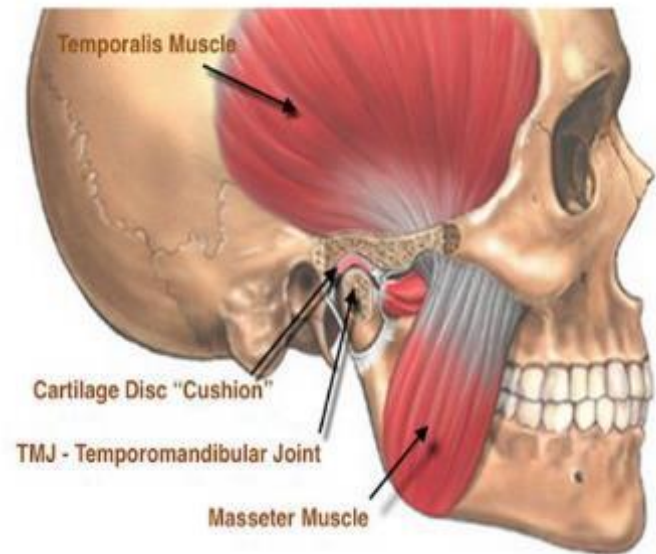
# Arm and shoulder muscles (p. 151)

- Deltoid stabilizes the shoulder
- Biceps and triceps flex and extend the elbow
- The pectoralis major depresses and adducts the arm



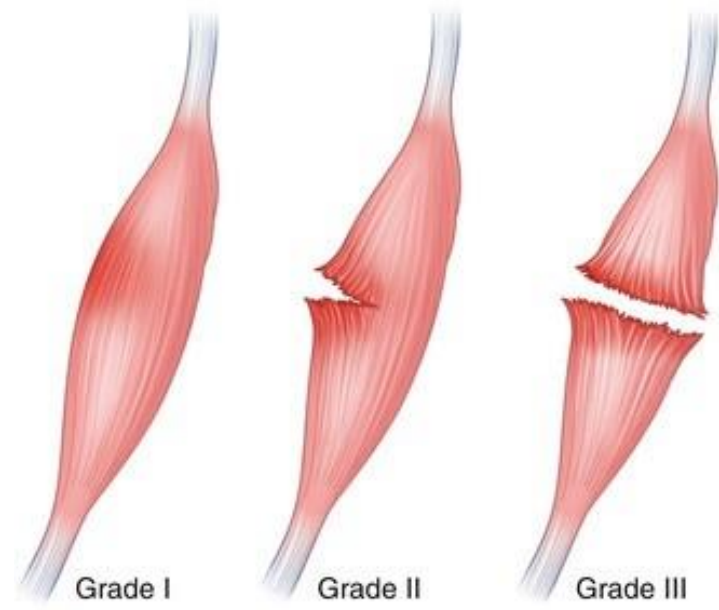
# The jaw muscles

- Masseter muscle covers the jaw and is used for chewing and clenching
- Inflammation of the masseter can also lead to trauma in the temporalis muscle which aids in mastication
- Smiling relaxes the face and the jaw
- Allow students to relax the lips and tongue and exhale deeply through the mouth after strong asana



# Muscle injuries

- Represent a great part of all traumas in sports medicine but there's not a real classification of muscle injuries
- We classify muscle injury broadly as traumatic (acute) or overuse (chronic) injuries.
  - Acute injuries mostly occur in contact sports and are a micro-trauma
  - Overuse injury is more subtle and occurs over a longer period of time. They result from repetitive micro-trauma
- A strain to a muscle or tendon is a contraction induced injury where the fibre tears from stress.
- Contusion: local muscle damage and bleeding like a bruise





# What is DOMS

- Delayed Onset Muscle Soreness → Spierpijn
- 24-72 hours after exercise
- We're not exactly sure what happens but we do know that tension force can cause small scale damage to the muscle (microtrauma)
- Soreness is a warning sign to reduce activity in order to prevent injury but research shows that light movement does help bloodflow to the muscle

So how do we deal with DOMS in our yoga classes? And does the anabolic window really exist?

# Homework

Draw your favorite yoga pose and color the muscles it activates

